## Space Weather Forecast

Issued on Wednesday, 13 December 2023 at 01:07 Local

**This forecast provides a four day assessment of space weather events. The probabilities stated below are for reaching or exceeding the given levels. For more information about space weather impacts please see the Met Office Space Weather Scales https://www.metoffice.gov.uk/weather/learn-about/space-weather/uk-scales**

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**Space Weather Forecast Headline: Chance of isolated Moderate flares.**

**Analysis of Space Weather Activity over past 24 hours**

**Solar Activity:** Solar activity has been Low with the peak flare a modest Common-class flare at 12/0338 UTC from a region located near centre disc in the north. This region has become the most active on the disc and is magnetically complex. In total there are seven sunspot regions on the disc. The largest region on the disc is now transiting the northwest quadrant. The smaller bipolar region to the south of this is the most active region on the disc and continues to develop. The other regions are currently relatively small and simple and are either stable or showing slight signs of decay.

A dimming event was observed in association with the above mentioned Common-class flare, initial analysis shows this is unlikely to hit earth, however model analysis are yet to processed so confidence is currently low. Otherwise no Earth-directed Coronal Mass Ejections (CMEs) were observed in available imagery.

**Solar Wind / Geomagnetic Activity:** Solar winds as observed were at slow-ambient levels. Wind speeds were initially around 310 km/s. Winds inclined from 12/1200 UTC, reaching 370-390 km/s and remaining there for the remainder of the period. This slight increase may result from weak influence from a High speed stream from a coronal hole, but more probably is a result of an unexpected glancing blow from a coronal mass ejection. The Total Interplanetary Magnetic Field (Bt) was initially weak, slowly rising to moderate by 12/1000UTC before falling back to weak from 12/1700UTC. The north-south component (Bz) initially varied weakly, before becoming moderately southwards around 12/1200UTC, then slowly rotated weakly positive by the end of the period. Geomagnetic activity was predominately quiet (Kp 0-2), but did become unsettled (Kp 3) between 13/1200-1800.

**Energetic Particles / Solar Radiation:** The count rate of energetic particles remained at background levels with no solar radiation storms observed.

**Four-Day Space Weather Forecast Summary**

**Solar Activity:** Generally Low solar activity is expected to continue, with a chance or slight chance of isolated M-flares. These are most likely to emanate from regions in the northwest quadrant.

**Solar Wind / Geomagnetic Activity:** There are no Earth-directed Coronal Mass Ejections (CMEs) currently expected in the forecast period. However confidence is very low regarding a CME observed in relation to the Common-class flare at 12/0338UTC, further analysis is required but currently it is not expected to hit Earth.

Solar winds are most likely to continue at background levels Days 1 (13 Dec) before the onset of a High speed stream during Day 2 (14 Dec). However, confidence is low in timing and peak wind speeds due to the non-persistent nature of this feature, but slightly elevated winds are expected, possibly reaching elevated levels.

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The current Quiet (Kp 0-2) geomagnetic activity is likely to continue until the onset of the HSS from CH79/+, which is anticipated to be on Day 2 (14 Dec). Unsettled to Active conditions are then likely, with a very slight chance of an isolated G1/Minor Geomagnetic Storm interval (Kp 5), but this is considered a low probability at this stage.

**Energetic Particles / Solar Radiation:** The count rate of energetic particles is forecast to remain at background levels with only a very slight chance of rising towards the S1/Minor Radiation Storm threshold should any significant flares occur from the two regions in the northwest quadrant.

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# Met Office Space Weather Forecast

**Geomagnetic Storms:**

| Geo-Magnetic Storm Probability (Exceedance) | Level | Past 24 Hours (Yes/No) | Day 1 (00-24 UTC) (%) | Day 2 (00-24 UTC) (%) | Day 3 (00-24 UTC) (%) | Day 4 (00-24 UTC) (%) |
|---|---|---|---|---|---|---|
| Minor or Moderate | G1 to G2 | No | 5 | 15 | 15 | 5 |
| Strong | G3 | No | 1 | 1 | 1 | 1 |
| Severe | G4 | No | 1 | 1 | 1 | 1 |
| Extreme | G5 | No | 1 | 1 | 1 | 1 |

**Radio Blackouts - X Ray Flares:**

| X Ray Flares Probability | Level | Past 24 Hours (Yes/No) | Day 1 (00-24 UTC) (%) | Day 2 (00-24 UTC) (%) | Day 3 (00-24 UTC) (%) | Day 4 (00-24 UTC) (%) |
|---|---|---|---|---|---|---|
| Active | R1-R2 M Class | No | 30 | 30 | 30 | 30 |
| Very Active | R3 to R5 X | No | 1 | 1 | 1 | 1 |

**Solar Radiation Storms - (High Energy Protons):**

| Radiation Storms Probability (Exceedance) | Level ($cm^{-2}$ $sr^{-1}$ $s^{-1}$) | Past 24 Hours (Yes/No) | Day 1 (00-24 UTC) (%) | Day 2 (00-24 UTC) (%) | Day 3 (00-24 UTC) (%) | Day 4 (00-24 UTC) (%) |
|---|---|---|---|---|---|---|
| Active | ≥ S1 | No | 5 | 5 | 5 | 5 |
| Very Active | ≥ S3 * | No | 1 | 1 | 1 | 1 |

* S3 ≥ 10 MeV ≥ 1000 pfu and / or ≥ 50 MeV ≥ 10 pfu. (pfu = $cm^{-2}sr^{-1}s^{-1}$)

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